

110. (New) A microwave plasma processing method according to claim 108, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

REMARKS

I. Substitute Declaration

An executed Substitute Reissue Declaration is enclosed herewith, as required by the Examiner. A Statement Under 37 C.F.R. § 3.73(b) and an Offer to Surrender Letters Patent, executed by the assignee, will be provided shortly. Applicants respectfully request that the requirement for these documents be held in abeyance until they can be obtained.

II. Substitute Specification

Enclosed herewith is a substitute specification in which the Certificate of Correction changes have been inserted, without bracketing or underlining, as required by the Examiner. The enclosed substitute specification includes four minor corrections shown on the attached mark-up (col. 8, line 54, col. 10, line 36, col. 16, line 13, and col. 25, line 7 of the issued patent; pages 14, 16, 26 and 41 of the substitute specification). Applicants note that a substitute specification is not ordinarily permitted in a reissue application (37 C.F.R. § 1.125(d), but that the substitute specification is being provided at the request of the Patent and Trademark Office. The undersigned certifies that no new matter has been added.

III. Status of the Claims

Upon entry of the foregoing amendment, claims 1-110 are pending in the application. Claims 1, 10, 19, 26, 38, 50, 60, 68, 78, and 86 are independent claims. Applicants gratefully acknowledge the indication of allowable subject matter in claims 1-18 and 26-49. Claims 19, 50, 60, 68, 78, and 86 have been amended in substantially identical fashion to better define the invention. Dependent claims 99-110, directed to the spacing of slots on the wave guide, have been added. No new matter has been added.

Support for the amendment can be found in the specification, claims and drawings as originally filed. The issued patent, No. 5,803,975, discloses that microwaves are irradiated through the plurality of slots (see Figures 6 and 8, for example), as recited in all of the amended claims. As noted in the patent at col. 8, lines 4-8, and as presently claimed, the microwaves propagating through the wave guide having the claimed dielectric material therein have a shortened wavelength (as compared to what they would have in the absence of the dielectric material).

New claims 99-110 are directed to the close spacing of the slots, which results in a highly dense, uniform plasma. Support for this subject matter is found throughout the patent disclosure, at least at col. 7, lines 48-58, at col. 8, lines 8-12, and at col. 11, line 9 to col. 12, line 6.

IV. Rejections Under 35 U.S.C. § 103(a)

Claims 19-25, and 50-98 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over JP 7-90591 (Suzuki), in view of JP 5-62796 (Inoue) and JP 7-263186 (Watanabe). Applicants respectfully traverse.

The provision of a dielectric material in an endless annular wave guide having a plurality of slots is not found in the prior art, and nothing in any of the references

cited would have made such a combination obvious. In fact, as described below, the structures shown in the prior art would not operate in their intended manner if the combination asserted by the Examiner were made.

As described in the specification at col. 7, line 67 to col. 8, line 12, providing the dielectric material in the annular waveguide shortens the wavelength of microwaves propagating in the wave guide. Consequently, a smaller spacing between slots is permitted, resulting in more irradiating sites, and therefore a more uniform and higher density plasma.

As amended, the claims set forth more clearly these important features of the claimed apparatus and method. Specifically, each of claims 19, 50, 60, 68, 78 and 86 recites that the dielectric in the annular wave guide shortens the wavelength of the microwaves propagating in the wave guide. Each of claims 19, 50, 60, 68, 78 and 86 further recites that the slots have microwaves radiating through them during operation of the apparatus. The recited combination permits more uniform, higher density microwave radiation to be achieved by the claimed method and apparatus.

Dependent claims 99-110 set forth the closer spacing of the slots. When referring to the spacing between slots, claims 99-110 recite that at least selected slots are spaced at $\frac{1}{2}$ guide wavelength intervals. It will be apparent that where adjacent slots are placed at $\frac{1}{8}$ guide wavelength intervals, each fourth slot would be at a $\frac{1}{2}$ guide wavelength interval. Likewise, where adjacent slots are placed at $\frac{1}{4}$ guide wavelength intervals, each second slot is at a $\frac{1}{2}$ wavelength spacing. Claims 99, 101, 103, 105, 107 and 109 recite the spacing broadly. Claims 100, 102, 104, 106, 108, and 110 recite the embodiments where adjacent slots are at $\frac{1}{4}$, or $\frac{1}{2}$ wavelength spacing.

A rejection under 35 U.S.C. § 103(a) must incorporate a determination of the scope and content of the prior art, the differences between the prior art and the claimed invention, and the level of skill in the art. Graham v. John Deere Co., 383 U.S. 1, 17 (1966). Secondary indicia of nonobviousness, such as commercial success, long-felt need, failure by others and copying are also considered. B.F. Goodrich Co. v. Aircraft Braking Systems Corp., 72 F.3d 1577, 1582 (Fed. Cir. 1996).

Turning to the scope and content of the prior art, the Examiner relies on the overall structure of Suzuki, which shows a plasma processing apparatus including an annular wave guide with a plurality of slots for radiating microwaves. The Office Action asserts that Suzuki “does not expressly disclose that the interior of the wave guide is filled with a second dielectric material.” Indeed, this is an understatement. Suzuki is directed to emitting a gas together with microwaves through a plurality of slots. Blocking the slots with dielectric would render the disclosed apparatus inoperative for the intended purpose. Applicants submit that Suzuki does not disclose a dielectric material in the claimed context and could not be adapted in the manner suggested by the Examiner. Certainly, such a modification would not be “obvious.”

The Office Action asserts that the dielectric missing from Suzuki could be adapted from the other cited references, Inoue and Watanabe. However, the two secondary references are not directed to the use of a plasma processing device with an annular wave guide. Consequently, there is no motivation to combine the elements of either Inoue or Watanabe with Suzuki. In fact, it is not at all clear that the combination asserted by the Examiner would have the results suggested by the Examiner.

Watanabe, for example, uses a dielectric material to reduce the size of a microwave transmission section, which is not the same problem as irradiating microwaves through the claimed slots. Thus there is no motivation to use a dielectric in combination with the plurality of slots as presently claimed. Likewise, Inoue, uses a dielectric to achieve a uniform distribution of plasma, but there is no disclosure regarding the consequences of combining a dielectric with an annular wave guide having a plurality of slots, a central combination of each of the present independent claims. Likewise, there is no disclosure of providing the multiple irradiation sites through the slots. Thus, it is not clear why the combination asserted in the Office Action would be expected to achieve the results suggested.

The law is very clear that a rejection under 35 U.S.C. § 103 must find specific motivation for the combination made. See In re Werner Kotzab, 217 F.3d 1365, 1371, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000) (“[A] rejection cannot be predicated on the mere identification . . . of individual components of claimed limitations. Rather particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed.”) Applicants respectfully submit that the disclosures of Inoue, Watanabe and Suzuki are not related, and that one of ordinary skill in the art would not find the claimed invention obvious in view of those references.

For at least the foregoing reasons Applicants submit that all of the pending claims are patentable over the prior art cited and respectfully request that the Examiner indicate allowable subject matter in all of the pending claims.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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